

1. Solve by completing the square: $x^2 + 3x + 1 = 0$

Soln: First we need to add the square of half the x -coefficient to both sides. The x -coefficient is 3. We get

$$\begin{aligned}x^2 + 3x = -1 &\Rightarrow x^2 + 3x + \left(\frac{3}{2}\right)^2 = -1 + \left(\frac{3}{2}\right)^2 \\ \Rightarrow \left(x + \frac{3}{2}\right)^2 &= \frac{5}{4} \Rightarrow x + \frac{3}{2} = \pm\sqrt{\frac{5}{4}} \Rightarrow x = -\frac{3}{2} \pm \frac{\sqrt{5}}{2}\end{aligned}$$

2. Solve by factoring: $2x^2 + 5x + 3 = 0$.

Soln: This can be factored as $(2x+3)(x+1) = 0$. So either $2x+3 = 0$ or $x+1 = 0$. Then $x = -2/3$ or $x = -1$. Check that they are the correct solutions by plugging them into the equation.

3.(10 points) The area of a window is to be 306 square cms. If the length exceeds the width by 1 cm, what are the length and the width? You MUST use quadratic equation.

Soln: Let l be the length and w be width. Then $lw = 306$. But we have $l = w + 1$. So $w(w + 1) = 306$ that is $w^2 + w - 306 = 0$. Using quadratic formula we get $w = (-1 \pm \sqrt{(-1)^2 - 4(-306)})/2 = (-1 \pm 35)/2$. Since width is positive we take $(-1+35)/2 = 17$ as the solution. Check that 17 times 18 is 306.

4.(10 points) Solve the following equations by converting them into quadratic equations:

(a) $\sqrt[4]{x^2 + 12} = 2$. (b) $\sqrt{15 - 2x} = x$.

(a) Taking fourth power of both sides, we get $x^2 + 12 = 2^4 = 16$. This gives $x^2 = 4$ from which we get that $x = 2$ or $x = -2$. Check that both are valid solutions by plugging into equation.

(b) Take squares of both sides to get $15 - 2x = x^2$. Bringing all to one side we get $x^2 + 2x - 15 = 0$ which factors as $(x + 5)(x - 3) = 0$. So $x + 5 = 0$ or $x - 3 = 0$ which gives $x = -5$ or $x = 3$. Of these only 3 is a valid solution because when you put $x = -5$ you get $\sqrt{15 - 2(-5)} = -5$ which is not true.